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Heng et al.

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(54) **CLOSURES**

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B65D 53/00 (2006.01)
B65D 43/04 (2006.01)

(52) **U.S. Cl.** **220/238**; 220/801; 220/806; 215/359

(58) **Field of Classification Search** 220/233, 220/234, 238, 262, 801, 805, 806; 215/294, 215/358, 359, 355; 138/90
See application file for complete search history.

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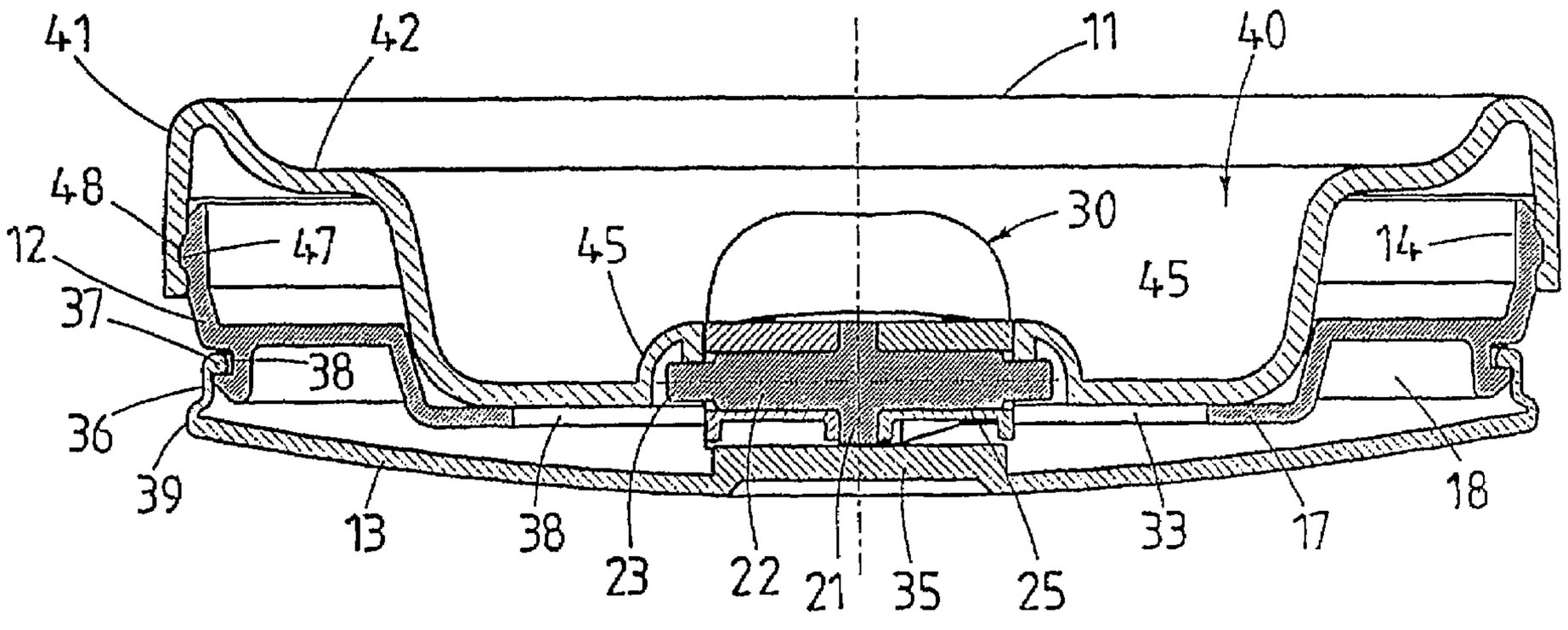
(57) **ABSTRACT**

A closure for the open mouth of an airtight container. The closure has a resiliently flexible diaphragm which has a peripheral edge (**37**) which can sealing engage against an inside wall surface of the open mouth. The diaphragm (**13**) is engaged with the second cover section (**12**) of a cover. A pair of toggles (**24**) are pivotally mounted on axles (**22**) of second cover section (**12**). The levers (**30**) of the toggles (**24**) extend through an opening (**44**) in the first or outer cover section (**11**) when the first and second cover sections (**11**,**12**) are snap-locked together. By moving the levers (**30**) toward one another the respective feet (**27**) of the toggle (**24**) engage with area (**35**) of the diaphragm (**13**) to deform the diaphragm and thereby break a sealing effect between the peripheral edge of the diaphragm and the inside wall surface of the open mouth.

13 Claims, 6 Drawing Sheets



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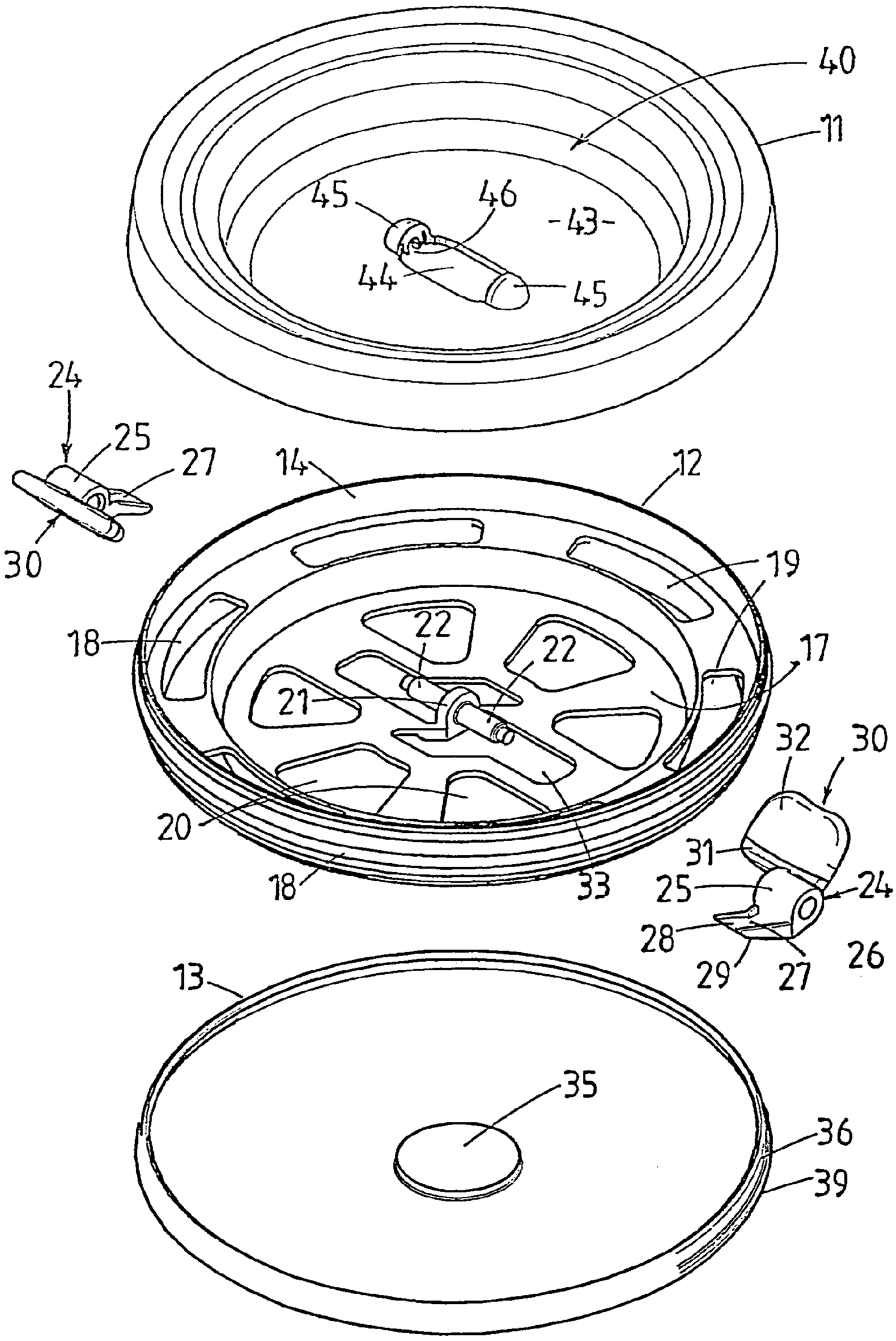
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FIG. 1.

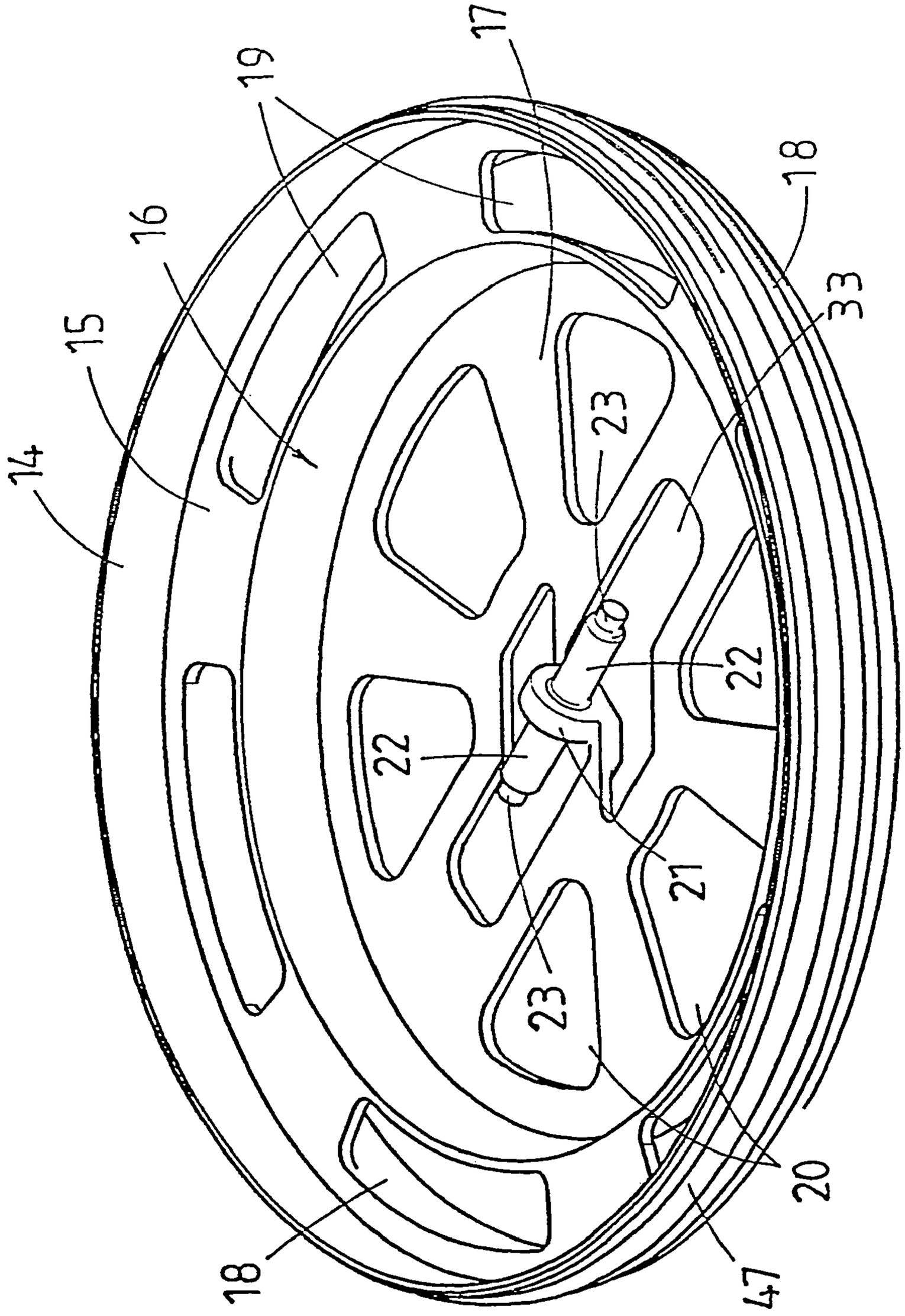

FIG. 2

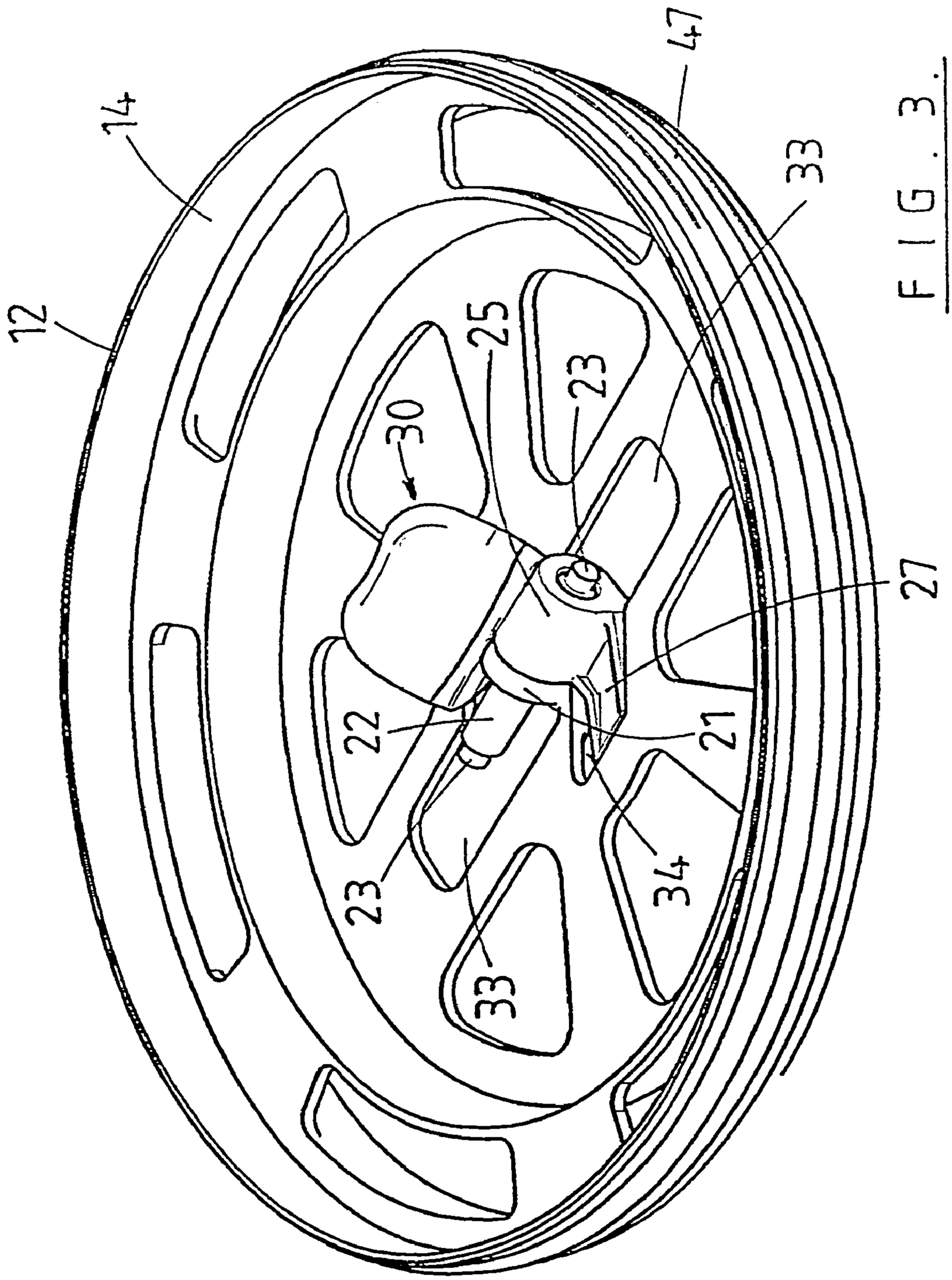

FIG. 3.

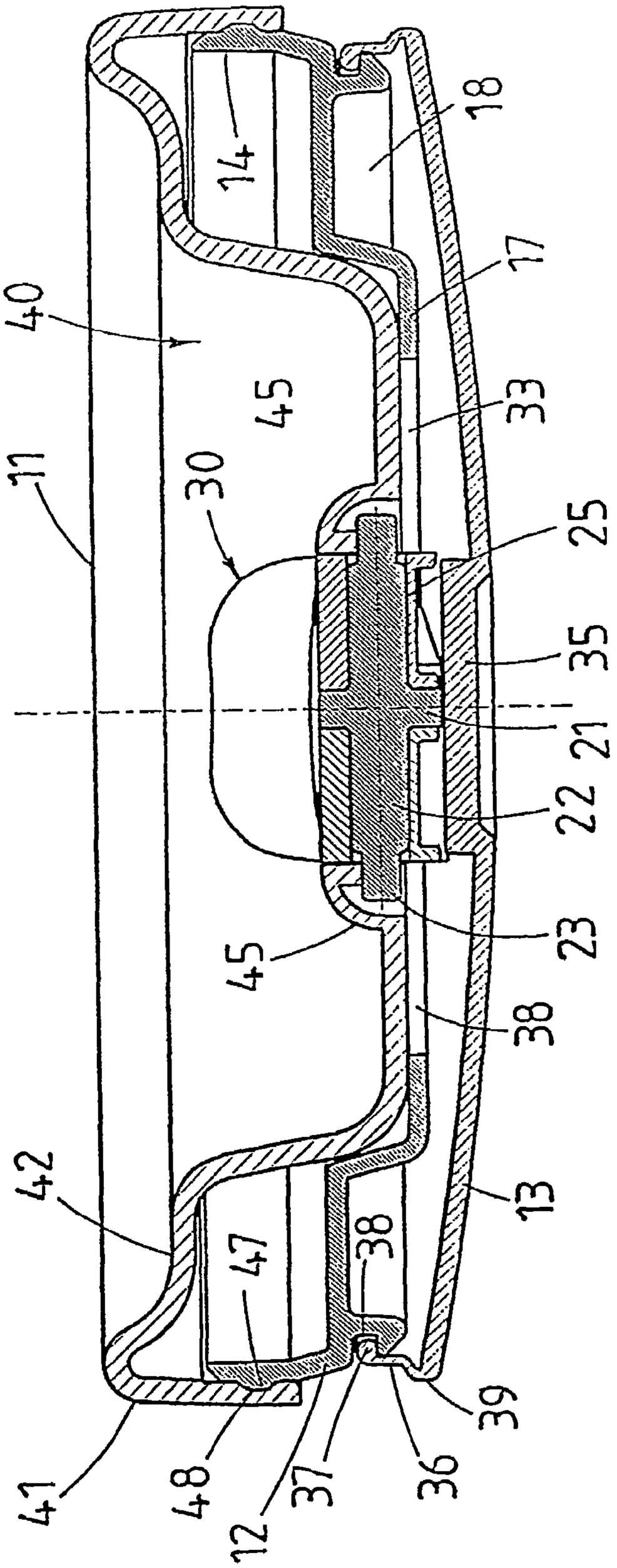
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FIG. 4.

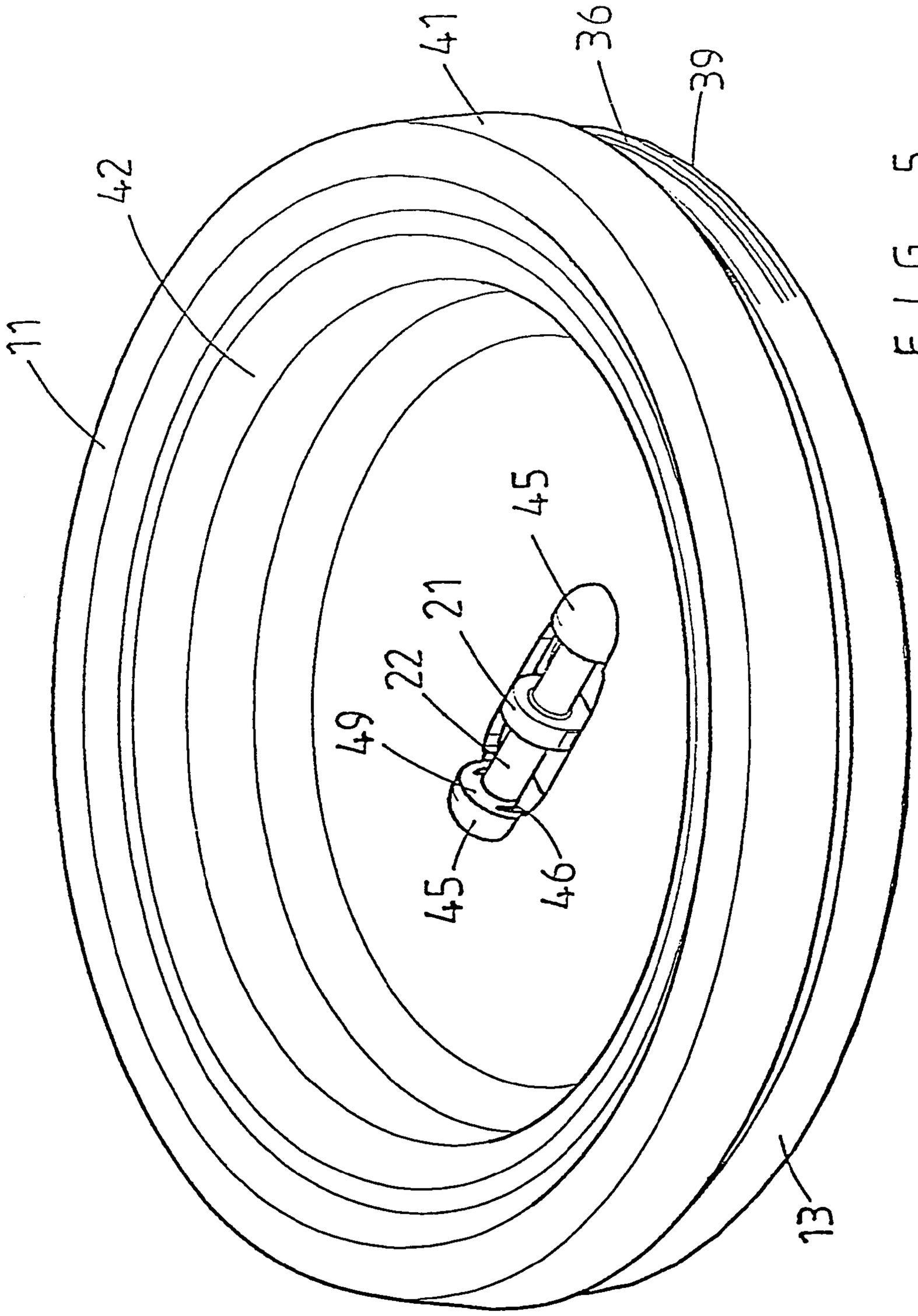

FIG. 5

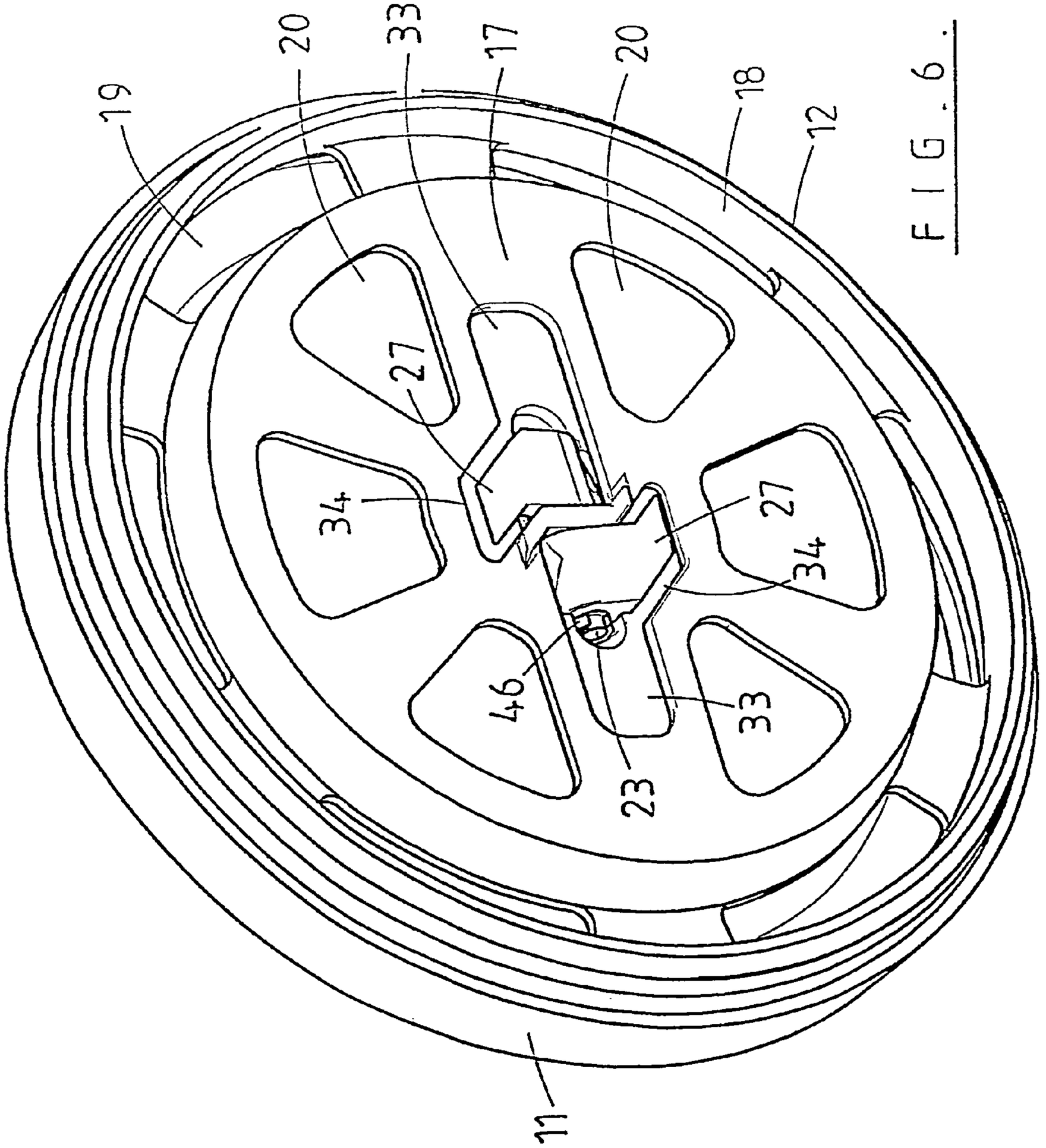

FIG. 6

CLOSURES

BACKGROUND OF THE INVENTION

The present invention relates to an improved closure and more particularly a closure for use with an airtight container.

It, is known from our New Zealand patent specification 211227 to provide an airtight container which includes a body having an open mouth into which a closure can sealingly fit. The mouth includes a peripheral wall surface against which a diaphragm of the closure can engage to sealingly close the mouth. A toggle arrangement is used to deform the diaphragm such that the sealing contact is broken, thereby permitting the closure to be removed and reinserted.

The closure of the type disclosed in our NZ 211227 has been very successful. However, it has been found that when the diaphragm is removed, as it often is by the user, it is possible to disassemble the toggle arrangement. This can cause damage to the toggle arrangement and/or present difficulty to the user to reassemble the toggle arrangement.

We have also found that it is desirable to be able to change the visual appearance of the closure so as to keep abreast of fashion changes and/or provide closures of different appearance so that container/closure combinations can be distinguished one from the other. For example, it is desirable to be able to provide closures of different appearances for different resellers of the product.

Furthermore, from a manufacturing point of view, there is always a need to strive for increased production rates with hopefully decreased production costs.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a closure for engagement with the mouth of a container, the closure being of an improved construction which at least goes some way to achieving one or more of the above desiderata.

Broadly in one aspect of the invention there is provided a closure for the open mouth of a container, the closure including a resiliently flexible diaphragm sealable against an inside wall surface of the open mouth of the container, a cover with which the diaphragm is mounted and deformation means whereby the diaphragm can be deformed so as to reduce an overall dimension of the diaphragm to break a sealing effect between a peripheral edge of the diaphragm and the inside wall surface, the cover being formed from first and second cover sections coupled together and retaining therebetween at least part of the deformation means.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following more detailed description of the invention reference will be made to the accompanying drawings in which:—

FIG. **1** is an exploded view of the closure illustrating the five components thereof,

FIG. **2** is a perspective view of the lower lid portion of the closure,

FIG. **3** is a view similar to FIG. **2** but showing one of a pair of toggles in place,

FIG. **4** is a cross-sectional view of the assembled closure, the cross-section being taken on a diameter through the centre of the axle on which the toggles are mounted,

FIG. **5** is a perspective view of the assembled closure but with the toggles not shown in place, and

FIG. **6** is a perspective underside view of the assembled closure but with the diaphragm removed.

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring to FIG. **1**, the five components comprising the closure are illustrated. These components are an upper lid **11**, a lower lid **12**, a diaphragm **13** and a pair of toggles **30**. As will be hereinafter described, the toggles **24** are located on respective axles **21** of the lower lid **12**. The toggles are operatively retained in place on axles **21** when the upper lid **11** and lower lid **12** are snap-locked together. The diaphragm **13** is snap-attached to the lower lid **12**.

The lower lid **12** includes a peripheral wall **14** which is connected by step **15** to a dished portion **16**. Located inward of the peripheral wall **14** and extending downwardly from step is a lower peripheral wall **18**.

Cutouts **19** are formed in step **15**. Cutouts **20** are also formed in the floor **17** of the dish portion **16**. These cutouts **19** and **20** reduce the amount of plastic required for moulding of the lower lid **12**. In addition, they provide an overall strengthening function. Furthermore, the cutouts **19** and **20** provide for drainage, when diaphragm **13** is removed, of any moisture buildup between the lower lid **12** and upper lid **11**.

In the centre of the dished portion **16** there is provided an axle support **21**. This projects above the upper surface (as viewed for example in FIGS. **1-3**) of the floor **17**. Projecting from the axle support **21** in opposed radial directions are axles **22**. At the distal end of each axle **22** is a stub-axle **23** which is of reduced diameter relative to the main axle **22**.

Each toggle **24** includes a boss **25** which has therethrough a bore **26**. The internal diameter of the bore **26** is just slightly greater than the external diameter of the main axle **22**. Projecting outwardly from the boss **25** is a toggle foot **27** which has a toe portion **28** and a cam face **29**.

Projecting to the other side of the boss **25** is an operating lever **31**. In the preferred form of the invention the toggle **24** is moulded from a hard plastic material. A plastic material which feels softer to the touch is over-moulded on operating lever **31** to form a finger grippable portion **32**.

In floor **17** of lower lid **12** are formed a pair of cutouts **33** which are located below the axles **22**/**23**. The cutouts **33** each extend beyond the distal end of the respective axle **23**. Cutouts **33** provide a clearance to enable the toggle **24** to be mounted on the axle **22** by inserting the axle **22** into bore **26**. This is achieved by positioning the toggle **24** and then sliding the boss **25** onto the axle **22**.

When the toggle **24** is placed in position (see FIG. **3**) the toggle foot **27** locates within a suitably shaped cutout **34** which merges into cutout **33**.

In FIG. **3** only one toggle **24** is shown in position. It will be appreciated that when the other toggle **24** is located in position the operating levers **31** are oppositely disposed. Also, the toggle feet **27** extend in opposite directions as can be seen in FIG. **6**.

The diaphragm **13** incorporates a central boss **35** which in the assembled closure is contactable by the toggle feet **27** as will hereinafter be described.

Extending peripherally about the diaphragm **13** is a wall **36**. The upper or distal end of the wall **36** includes an inwardly projecting rim **37**. When the diaphragm **13** is assembled with the lower lid **12** this rim **37** snap-attaches in a groove **38** formed in the lower peripheral wall **18** of the lower lid **12**.

A sealing edge **39** is formed at the peripheral extremity of the diaphragm **13**. This sealing surface **39** sealingly engages with a surface of the mouth of the container in which the closure is sealingly located in use.

The upper lid **11** includes a dish portion **40**. The dish portion **40** is connected to a peripheral downwardly depend-

ing skirt **41** by a stepped portion **42**. This stepped portion **42** forms a shelf able to receive the lower end of a similar container so that containers with closures according to the present invention can be stacked one upon the other.

In the floor **43** of dish portion **40** there is formed an aperture **44**. The aperture **44** is elongate in form and at each end thereof there is formed a housing **45** which has a downwardly depending substantially U-shaped clip **46**. This clip **46** is designed to snap-lock engage with the stub-axle **23** when the upper lid **11** and lower lid **12** are combined. The arrangement is such that stub-axle **23** is held within clip **46**.

The outer peripheral surface of the peripheral wall **14** of the lower lid **12** is profiled so that it can snap-lock fit with a similarly profiled inner face surface of the skirt **41** of upper lid **11**. As can be seen in FIG. **4**, the peripheral wall **14** essentially has a rib **47** which interengages with a peripherally extending groove **48** in the inside surface of skirt **41**.

With the toggles **24** located on the axles **22** the lower lid **12** can be assembled with the upper lid **11**. To achieve this the toggle operating levers **32** are pulled toward one another so as to be able to fit through aperture **44** in floor **43** of the dish portion **40**. The upper lid **11** and lower lid **12** can then be brought together so that dish portion **40** locates within dish portion **16**. When these mate together, as shown in FIG. **4**, the peripheral wall **14** of the lower lid **12** snap-fits within the skirt **41** of the upper lid **11**. Also, the stub-axles **23** snap-lock into the respective clips **46** of the housing **45** at the opposite ends of elongate slot **44**.

The lower lid **12** is thus not only interengaged with the upper lid **11** at the interjoin of the peripheral wall **14** and skirt **41** but is also positively locked centrally to the upper lid **11** by virtue by the stub-axles **23** locking into clips **46**. This interengagement of the clip **46** and stub-axles **23** not only forms a mechanical join between the upper lid **11** and lower lid **12** but also ensures that the toggles **24** are correctly retained on the axles **22**.

As can been in FIG. **4**, the dimensions are such that the boss **25** of each toggle **24** locates snugly between the axle support **21** and a face surface **49** (see FIG. **5**) of the housings **45**. Furthermore, the dimensioning of the boss **25** and the elongate slot **44** is such that the edge of the slot **44** closely locates adjacent the surface of the boss **25**.

Due to the snap-lock coupling of the upper lid **11** with the lower lid **12** it is difficult to visually see that the lid is formed from two separate components. Thus, the lid portion of the closure has good structural integrity. Furthermore, it is believed that, in use, an end user will not try and disassemble the toggles **24** from the lid construction **11**/**12**.

With the lid assembled the diaphragm **13** can then be located in place by distorting the diaphragm wall **36** so that the rim **37** can engage in groove **38**. The resultant assembly locates the diaphragm boss **35** adjacent the cam face **29** and toe **28** of each toggle **24**. Thus, a user can, by gripping the operating levers **30** and squeezing them toward each other, cause the toggle feet **27** to apply a downward force on the diaphragm boss **35**.

The force applied by the toggles **24** to the diaphragm boss **35** causes an effective reduction in the diameter of the peripheral edge of diaphragm **13** thereby pulling sealing edge **39** away from the facing surface of the mouth of the container in which the closure is located. The closure can then be lifted away from the container.

The same procedure is adopted when placing the closure back in the mouth of the container. Thus, once the closure is located in place the user releases pressure on the toggles. Because of the resiliency built into the diaphragm it restores itself to its normal configuration. This results in the sealing edge **39** engaging in the required sealing manner with the peripheral surface of the mouth of the container. This restoring of the diaphragm **13** to its normal state causes the toggles **24** to revert to their "rest" position.

The present invention therefore provides a closure which is formed of first and second lid sections coupled together and retaining in place therebetween the deformation means in the form of a pair of toggles. These toggles are located opposite one another and can function about a radial axis to achieve a vertical force/movement of the diaphragm. This vertical movement is a preferred form of the invention exceeds about 7 mm and thus can deform the diaphragm so that the peripheral sealing edge thereof can be reduced so as to break a seal between the peripheral edge and the sealing wall surface of the open mouth of a container.

Not only does the two-part construction of the lid provide a means of readily locking and retaining the toggles in place but it also permits a manufacturer to have a standard sub-base (the lower lid **12**) and diaphragm **13** and thereby only needs to change the cover portion i.e. the upper lid **11** to change the appearance of the closure. Thus, different aesthetic designs can be readily achieved without major retooling on the part of the manufacturer.

It is also believed that the present invention can lead to increased production rates and hopefully a reduction in production costs. The closure is easy and foolproof to assemble and when assembled retains the toggle mechanism so that it will not fall out and will not be readily accessible by the end user even when the diaphragm is removed.

It is also anticipated that the upper and lower lids can be manufactured in a single tool. So that upon removal of the components from the tool the lid can be immediately assembled with previously moulded toggles. This will cut down on handling within the manufacturing plant and also enables quality control to take place at the point of primary manufacture. The assembled lid can then be fitted with a separately manufactured diaphragm to complete the assembly of the closure.

The invention claimed is:

1. A closure for the open mouth of a container, the closure including:

a resiliently flexible diaphragm including a sealing edge with a perimeter defining a periphery of the diaphragm, the sealing edge of the diaphragm being sealable against an inside wall surface of the open mouth of the container;

a cover with which the diaphragm is mounted; and

a deformation mechanism, whereby the diaphragm can be deformed so as to reduce a length of the perimeter of the sealing edge of the diaphragm to break a sealing effect between the sealing edge of the diaphragm and the inside wall surface,

wherein the cover comprises first and second cover sections coupled together and retaining therebetween at least part of the deformation mechanism,

wherein the first and second cover sections are coupled together by first and second separate mechanical connections, and

wherein the first mechanical connection is formed by fitting together a peripheral skirt of the first cover section and a peripheral wall of the second cover section in an overlapping arrangement.

2. A closure as claimed in claim **1** wherein the second mechanical connection is formed by the first cover section interlocking with a part of the deformation mechanism mounted by the second cover section.

3. A closure as claimed in claim 1 wherein the first cover section includes a dished portion, which engages within a dished portion of the second cover section.

4. A closure as claimed in claim 3 wherein the dished portion includes drainage openings for drainage of any accumulation of moisture between the first and second cover sections.

5. A closure as claimed in claim 2 wherein the diaphragm is mounted to the cover by the second cover section.

6. A closure as claimed in claim 5 wherein the second cover section includes a peripheral groove into which is fitted a peripheral projection of the diaphragm.

7. A closure for the open mouth of a container, the closure including:

a resiliently flexible diaphragm including a sealing edge with a perimeter defining a periphery of the diaphragm, the sealing edge of the diaphragm being sealable against an inside wall surface of the open mouth of the container;

a cover with which the diaphragm is mounted; and

a deformation mechanism, whereby the diaphragm can be deformed so as to reduce a length of the perimeter of the sealing edge to break a sealing effect between the sealing edge of the diaphragm and the inside wall surface,

wherein the cover comprises first and second cover sections coupled together and retaining therebetween at least part of the deformation mechanism,

wherein the deformation mechanism includes a pair of toggles pivotally mounted with the cover, each toggle including an engagement portion engageable with a contact area of the diaphragm, and

wherein the second cover section includes a pair of axles, each axle engaging with a sleeve of a toggle, and wherein each axle has a stub axle which is held within a clip of the first cover section.

8. A closure as claimed in claim 7 wherein the deformation mechanism includes a pair of toggles pivotally mounted with the second cover section, the pivoted mounting incorporating at least one stub-axle, which is connected to a mounting of the first cover section to form a second mechanical connection.

9. A closure as claimed in claim 7 wherein each toggle includes a lever, which projects through the first cover section, said lever being overmoulded with a soft feel plastic material.

10. A closure as claimed in claim 7 wherein each toggle includes a lever, which projects through an opening in the first cover section, said levers being oppositely disposed.

11. A closure as claimed in claim 10 wherein each lever projects from a respective sleeve, each sleeve being pivotally mounted on an axle carried by the second cover section, and wherein the engagement portion is formed by a foot, each foot being coupled to a respective sleeve, and each foot projecting from a side of the respective sleeve that is substantially opposite to the side from which the lever projects.

12. A closure as claimed in claim 11 wherein each foot extends on an incline relative to a central pivot axis of the respective sleeve.

13. A closure for the open mouth of a container, the closure including:

a resiliently flexible diaphragm including a sealing edge with a perimeter defining a periphery of the diaphragm, the sealing edge of the diaphragm being sealable against an inside wall surface of the open mouth of the container;

a cover with which the diaphragm is mounted; and

a deformation mechanism, whereby the diaphragm can be deformed so as to reduce a length of the perimeter of the sealing edge to break a sealing effect between the sealing edge of the diaphragm and the inside wall surface,

wherein the cover comprises first and second cover sections coupled together and retaining therebetween at least part of the deformation mechanism,

wherein the deformation mechanism includes a pair of toggles pivotally mounted with the cover, each toggle including an engagement portion engageable with a contact area of the diaphragm,

wherein each toggle includes a lever, which projects through an opening in the first cover section, said levers being oppositely disposed,

wherein each lever projects from a respective sleeve, each sleeve being pivotally mounted on an axle carried by the second cover section, and wherein the engagement portion is formed by a foot, each foot being coupled to a respective sleeve, and each foot projecting from a side of the respective sleeve that is substantially opposite to the side from which the lever projects,

wherein each foot extends on an incline relative to a central pivot axis of the respective sleeve, and

wherein the foot has a distal end, which engages with an area of the diaphragm which is of increased thickness.

* * * * *